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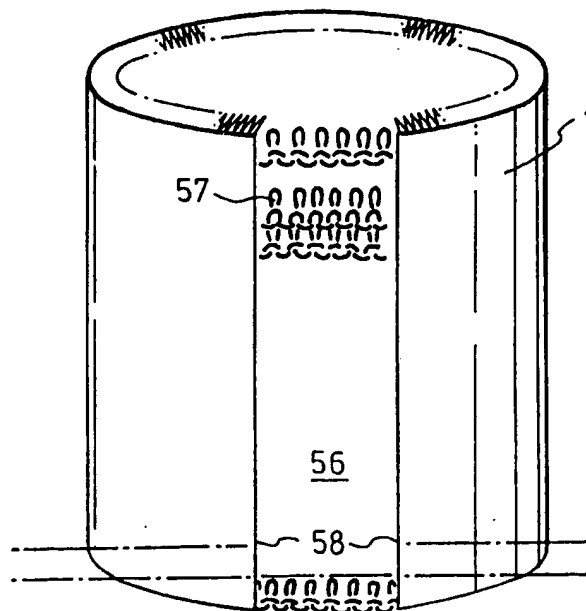
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(54) Production of webs of knitted fabric with combed-in fibres on a circular knitting machine

(57) To produce webs of varying width without changing the diameter of the knitting cylinder a tube of fabric 1 is knitted with a strip 56 containing only the basic knitted fabric. This strip is cut away along the lines 58 to leave

the web of required width. To form the strip a group of adjacent needles consisting of a variable number of needles, according to the width required, has no fibres fed to it at any of the combing-in points and the feed of fibres to the combing-in points is interrupted during the passage of this group of needles.

Fig. 3.



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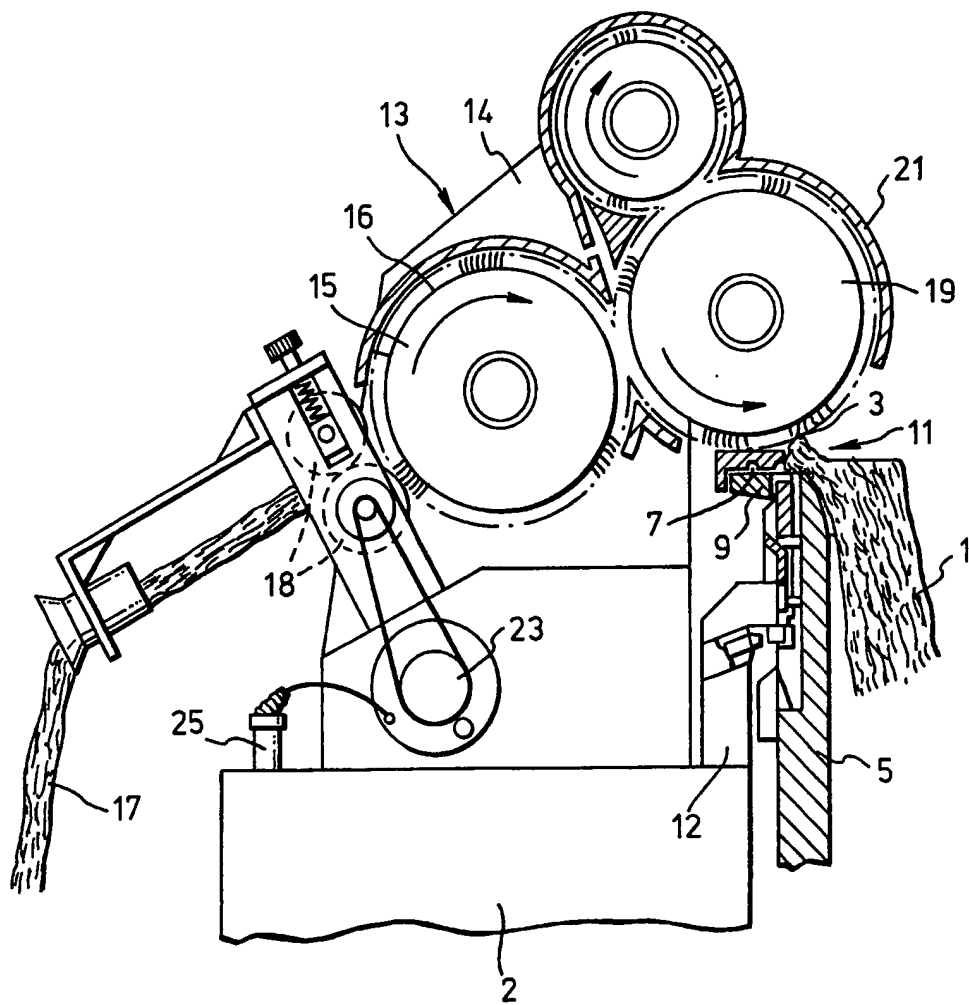
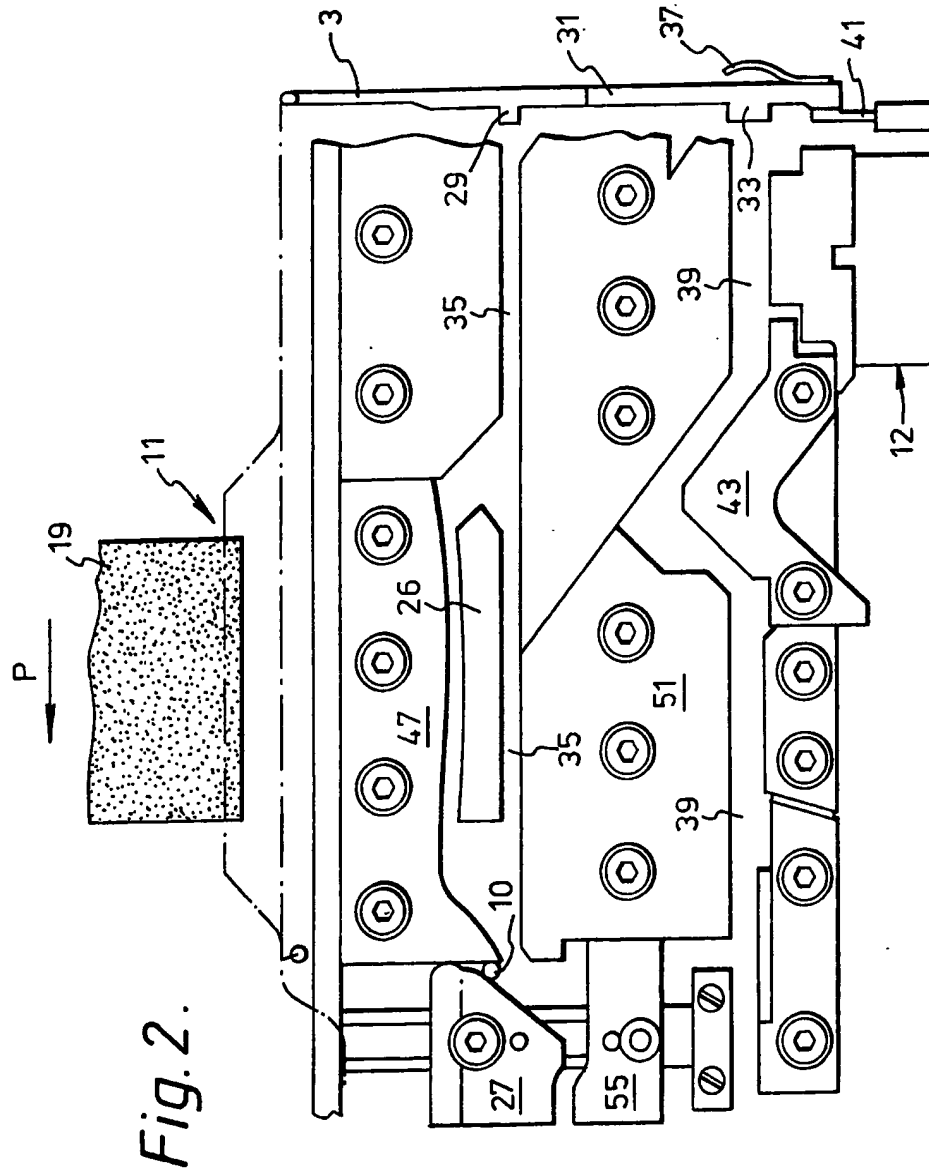


Fig. 1.



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Fig. 3.

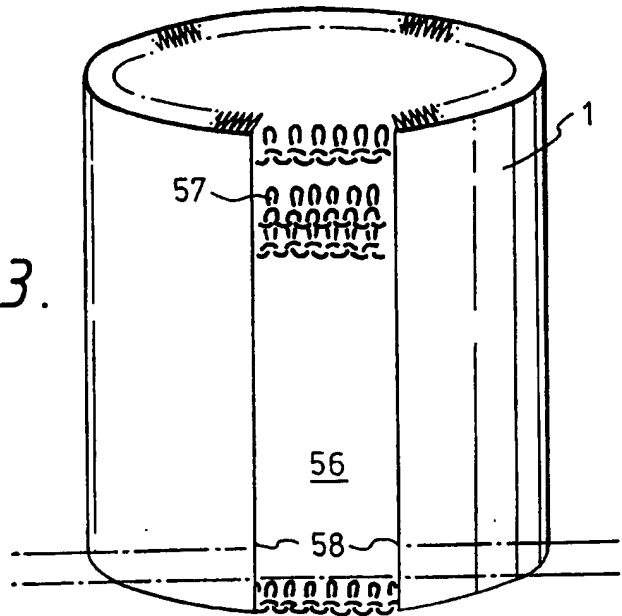
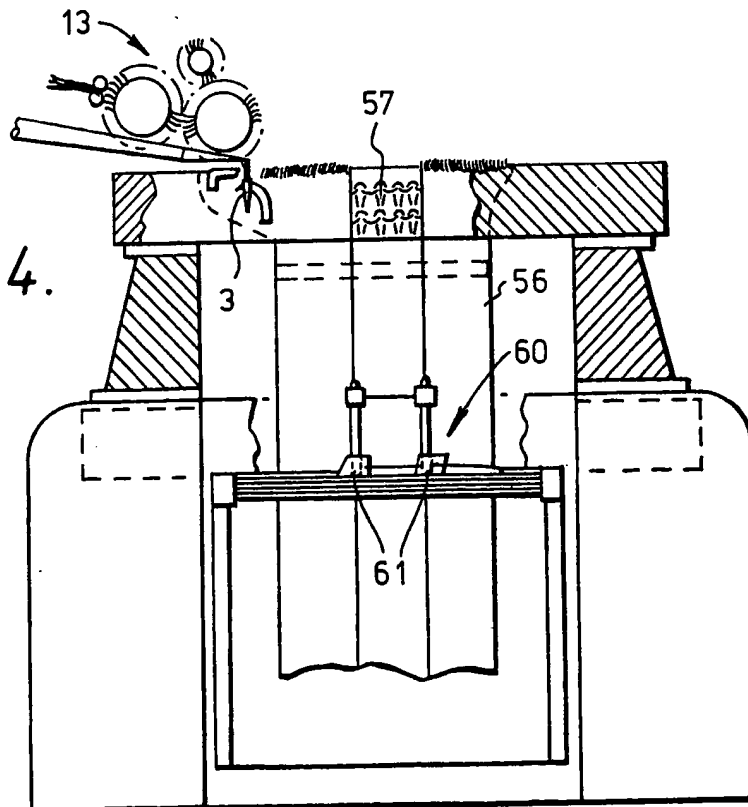


Fig. 4.



## SPECIFICATION

**Production of webs of knitted fabric with combed-in fibres on a circular knitting machine**

The invention relates to a process and to a  
5 circular knitting machine of the types defined in the pre-characterising clauses of Claims 1 and 4.

A material made according to this process or on such a circular knitting machine is processed, for example, into carpets, bedspreads, counterpanes,  
10 articles of clothing or upholstery covers. Webs of material having widths of approximately 1.40 m to 3.80 m are preferably used as a starting point for this purpose. Consequently, a requirement of the knitting works is that the knitted hoses delivered  
15 by the circular knitting machines lead, when cut open, directly to webs of material having the widths mentioned, in order, on the one hand, to save the working times and working equipment necessary for cutting to size and/or sewing  
20 together webs of material having larger or smaller widths, and, on the other hand, to avoid waste products as far as possible, because of the high proportion of cost for the combed-in fibre material in relation to the basic knitted fabric.

Since, as in all the other spheres of circular knitting, the width of a web of material made according to the above-mentioned process depends essentially on the diameter of the knitted hose produced by the circular knitting machine  
30 and, therefore, on the diameter of the needle cylinder of the circular knitting machine, circular knitting machines having different needle cylinder diameters are offered by the circular knitting machine industry for the purpose of meeting this  
35 requirement. However, this leads to the disadvantage that the knitting works must at least keep in stock sufficient quantities of all the available types of circular knitting machines, in order to be able, at any time, to produce and  
40 supply webs of material of all the current widths, according to market needs which always fluctuate greatly, without long change-over times and without machine purchases made only when required.

45 The object of the invention is to provide a process and a circular knitting machine, by means of which webs of material of variable width, especially webs of material having all the widths mentioned above, can be made, without losses of  
50 fibre material having to be allowed for as a result.

The characterising features of Patent Claims 1 and 4 are envisaged to achieve this object.

The circular knitting machine according to the invention can additionally be characterised by the  
55 features of Claim 5, depending on whether the strip is to be cut out from the basic knitted fabric during the continuous knitting operation or at a later time.

The invention starts from the idea of making a  
60 knitted hose which consists of the basic knitted fabric and the diameter of which corresponds to the largest width of the webs of material conventionally to be processed, but of ensuring, at the same time, by means of a suitable control, that

65 the expensive fibre material is combed or tied into the basic knitted fabric only over a width corresponding to the width of the web of material desired in the individual case. This results in the essential advantages that no substantial changes  
70 need to be effected on the circular knitting machine, as would be the case, for example, in the provision of a circular knitting machine on the open-end principle, and that the waste, arising because the cut-out strip is discarded, always  
75 consists only of the relatively cheap basic knitted fabric, but not also of the expensive fibre material.

The invention is described in more detail below in an exemplary embodiment in conjunction with the attached drawing in which:

80 Figure 1 shows diagrammatically the side view of a circular knitting machine according to the invention, for making a knitted hose consisting of a basic knitted fabric and of fibres combed into the latter;

85 Figure 2 shows diagrammatically a cut-out of the cam assembly of the circular knitting machine according to Claim 1;

Figure 2 shows, in a diagrammatic and perspective view, a knitted hose made on the  
90 circular knitting machine according to Figures 1 and 2;

Figure 4 shows diagrammatically the front view of the circular knitting machine, with the devices necessary for cutting open the knitted hose.

95 According to Figures 1 and 2, a circular knitting machine for making a knitted hose 1 with combed-in fibres possesses a baseplate 2, in which a needle cylinder 5 fitted with knitting needles 3 and a sinker ring 9 fitted with sinkers 7  
100 are mounted rotatably. The knitting needles 3 and sinkers 7 are controlled in a conventional way by cam parts. Provided on the periphery of the needle cylinder 5 are several spaced knitting points 10 (Figure 2), at which a basic thread is fed to the  
105 knitting needles 3, to make a hose-shaped basic knitted fabric in a known way.

Provided in a peripheral direction, between the knitting points 10, are combing-in points 11, at which fibres are inserted into the knitting needles  
110 3 selected by means of a pattern device 12 assigned to each of said needles. According to Figure 1, there is provided for this purpose, at each combing-in point 11, a fibre-feed device 13 which is fastened to a frame 14 and which serves to feed  
115 fibres of a certain characteristic, for example colour, to the needles 3 selected to receive fibres. Each feed device 13 consists, for example, of a tambour 15 with a card clothing 16, to which fibres are fed in the form of a roving 17 by means  
120 of a pair of feed rollers 18, and of a doffing or comb-in roller 19 with a card clothing 21, by means of which the fibres taken off the tambour 15 are offered to the selected needles 3.

The drive of the feed rollers 18 is controlled by means of a control device 25, for example a clutch, a stepping motor or another suitable device, in such a way that, averaged over relatively short periods of time, the fibres are transferred from the tambour 15 onto the combing-in roller 19

in the amount required according to the pattern.

Figure 2 illustrates that part of the cam assembly of a circular knitting machine according to the invention which comprises a pattern device 12, a combing-in point 11 with a combing-in roller 19 and of a width corresponding to the length of an insertion cam part 26, and a knitting point 10 with a knitting cam part 27. Otherwise, only those parts of the circular knitting machine which are necessary for understanding the invention are illustrated in Figure 2.

As indicated diagrammatically in the right-hand part of Figure 2, the needles 3 of the circular knitting machine can be selected independently of one another, are provided with feet 29 and are guided in grooves of the needle cylinder. Push-fingers 31 pivotable underneath the knitting needles 3 and having push-finger feet 33 are located in the same grooves. The needle feet 29 are normally located in a tucking track 35, and the push-finger feet 33 are located in a push-finger track 39 because of the action of a spring 37 supported in the groove bottom. Assigned to each push-finger is a control spring 41 which is fastened to the needle cylinder and which is influenced during its passage past the pattern device 12, in such a way that the push-finger foot 33 of the associated push-finger either remains in the push-finger track 39 and is then lifted by a lifting part 43 or is taken out of the push-finger track 39 because of pivoting of the push-finger and then slides along behind the lifting part 43. Pattern and selecting devices of this type are described in detail in German Auslegeschrift 1,585,211 and in German Offenlegungsschrift 2,102,719 and the equivalent U.K. Specification No. 1,384,631, to which express reference is made here, so as to avoid further details.

The feet 29 of the knitting needles 3 assigned to a push-finger 31 lifted by the lifting part 43 are lifted by said push-finger onto the insertion cam part 26. This insertion cam part 26 is located at such a height that the fibres fed by means of the combing-in roller 19 are inserted into the hooks of the knitting needles 3 sliding on said cam part. Details of this operation are known from the patent publications mentioned above.

Adjoining the insertion cam part 26, in the first place, is a drawing-off edge which is attached to a guide cam part 47, in order to lower the knitting needles to a height at which they receive the basic thread at the knitting point 10. In this case, the counter-guide is effected by a cam part 51 which also holds, in the track 35, the needle feet 29 sliding underneath the insertion cam part 26.

A guide cam part 55 is provided, in the direction of rotation of the needle cylinder (arrow P), behind the guide cam part 47 of the knitting cam part 27 and behind the cam part 51. The knitting needles are lowered into the knocking-over position by means of the knitting cam part 27, so that the basic thread inserted into their hooks is processed into stitches, and, at the same time, the fibres are tied into the stitches of the basic thread. After the stitching, the knitting

needles are lifted again, by means of an elevation on the guide cam part 55, to the height corresponding to the track 35, so that a new selecting operation can take place.

Circular knitting machines of the type described are known, for example, from German Patent Specification 1,201,509 and from German Offenlegungsschriften 2,115,721, 2,343,886 (U.K. equivalent No. 1,479,368) and 2,524,491, to which express reference is made here. The stitching operation described above is also known. In this case, the fibres can be inserted in all the known ways (for example, German Auslegeschriften 1,585,051 or 1,943,345).

In conventional knitting on a circular knitting machine of the type described, the width of the web of material obtained by slitting open the knitted hose 1 depends on the diameter of the knitted hose 1 or on the diameter of the needle cylinder 5 of the circular knitting machine. If smaller or larger widths of material are desired, either a needle cylinder with a smaller or larger diameter must be provided or the desired width must be obtained by cutting to size and/or sewing together the width of material obtained. Both possibilities entail various disadvantages.

It is therefore proposed, according to the invention, to produce, on the circular knitting machine described, webs of material of a preselectable (variable) width, due to the fact that fibres are fed, at no combing-in point 11, to a group of knitting needles 3 comprising a selected number of adjacent knitting needles, so that the knitted hose 1 (Figure 3) receives over its entire length a strip 56 consisting only of the basic knitted fabric 57 made by means of the knitting points 10. In this case, the width of this strip 56 corresponds to the number of needles in the selected group of needles, and the side edges of this strip 56 extend parallel to the stitch wales. To ensure that the needles of the selected group of needles do not receive fibres at any combing-in point 11, the pattern devices 12 are controlled so that the feet 29 of the needles of the selected group of needles slide along under the insertion cam parts 26 at all the combing-in points 11. As a result, each of these selected needles 3 receive only the basic thread forming the strip 56.

During those periods of time when the needles of the selected group of needles slide along under the insertion cam parts 26, fibres normally continue to be conveyed to the combing-in points 11. There arises, as a result, in this region, for example on the surface of the combing-in roller 19, an excess of fibres, which has an unfavourable effect on a uniform feed of fibres into those needles following the needles of the selected group of needles. To prevent an excess of fibres of this nature, the control devices 25 are controlled so that no fibres are fed to the assigned combing-in points 11 at those times when the needles of the selected group of needles pass the combing-in point 11. In this case, this control must be effected with a certain time advance, to allow for the distance which the fibres have to cover from the

feed rollers 18 over the tambour 15 and the combing-in roller 19 up to the combing-in point 11.

Because of the control described, the strip 56 consists only of the basic knitted fabric and can therefore be cut out from the finished knitted hose 1 without costly losses of fibre. After the strip 56 has been cut out along the cutting edges 58 (Figure 3), which are sharply delimited as a result of the needle and fibre control, the remaining web of material consisting of a basic knitted fabric with combed-in fibres has the desired width.

The special advantage of this process is that, solely by fixing the number of needles belonging to the selected group of needles, any width of material whatever, up to the maximum width of material predetermined by the cylinder diameter, can be produced. Consequently, if, for example, a circular knitting machine with a needle-cylinder diameter of forty-eight inches (corresponding to 1.22 m) is used, it is possible, without having to change the type of machine, to make both webs of material having widths of approximately 3.80 m, which are suitable for carpet production, and widths of material of approximately 3.0 m, which are suitable for the production of bedspreads or counterpanes, as well as widths of material of approximately 1.90 m, which are suitable for the production of articles of clothing and upholstery covers. Circular knitting machines with cylinder diameters of twenty-four or thirty-eight or forty-eight inches have been necessary, hitherto, for the same purpose, if costly losses of fibre are to be avoided.

The basic knitted fabric 58 within the strip 56 can be knitted or made by means of floating fibres, for example in a 1:1 to 1:4 pattern, in order to reduce also the consumption of basic thread in this region, in comparison with a basic knitted fabric made with all the needles.

A circular knitting machine for applying the process according to the invention is preferably characterised by a cutting device 60 (Figure 4) which has two cutting elements 61 adjustable to the width of the strip 56, for example slitting-open blades according to German Offenlegungsschrift 2,633,912. This results in the additional advantage that the web of material taken from the machine already has the desired width, and an additional working operation is saved. In this case, it can be envisaged to wind the strip 56 onto the same roller as the remaining web of material, but it is also possible to envisage a special winding-on device for the strip 56. The two cutting elements 61 are each set to the width corresponding to the number of needles in the group of needles.

Instead of only one strip 56, two or more strips can also be produced by controlling the pattern devices 12 and the control device 25 in a suitable way. If, for example, a web of material corresponding to half the width of the slit-open knitted hose 1 is desired, two strips are provided, so that two webs of material of the desired width are obtained.

If a circular knitting machine with a plurality of

knitting points 10 and combing-in rollers 11 is envisaged, the selected group of needles is controlled, in the way described, at all the knitting and combing-in points. The same applies accordingly to the control of the control devices 25.

The use of the process according to the invention is not restricted to the circular knitting machine described, but can be applied to all circular knitting machines which permit individual needle selection and which have a control device for controlling the feed of fibres to the combing-in point. Basically, it does not matter how the needles are selected and how the fibres are fed into the needle hooks. However, the pattern devices 12 should permit an arbitrary selection of all the needles 3 present, so that the choice of strip width is not subject to any restrictions because of any repeats of the pattern register which may be necessary.

#### CLAIMS

1. Process on a circular knitting machine for making a knitted tubular article consisting of a basic knitted fabric and of fibres combed into the latter, a basic thread being fed to the knitting-machine needles at each of a plurality of knitting points spaced along the periphery of the cylinder of the knitting machine and fibres being fed at each of a plurality of combing-in points spaced along the periphery of said cylinder, characterized in that, to produce a fabric of a preselected width, at least one group of needles consisting of a preselected number of adjacent needles has no fibres fed to it at any of the combing-in points, so that the tubular good contains at least one strip which consists only of the basic knitted fabric and runs parallel to the wale direction and the width of which corresponds to the number of needles in the group of needles, in that the feed of fibres to each of the combing-in points is interrupted during the interval of time corresponding to the passage of the said group of needles past the combing-in point, and in that the fabric of a preselected width is obtained from the tubular article by cutting away the strip consisting only of the basic knitted fabric.

2. Process according to claim 1, characterized in, that the basic knitted fabric within the strip is knitted in a 1:1, 1:2, 1:3 or 1:4 pattern or consists of floating threads.

3. Process according to claim 1 or 2, characterized in, that the strip is cut out during the continuous knitting operation.

4. Circular knitting machine for carrying out the process according to one of claims 1 to 3, characterized by a needle cylinder (5), the diameter of which corresponds to the largest desired width of the fabric and in which a plurality of knitting needles are mounted, by at least one pattern device (12) for selecting the group of needles, the pattern width obtainable by means of the pattern device (12) corresponding essentially to the number of needles of said cylinder, and by a control device (25) for controlling the feed of

fibres to the combing-in points (11) in dependence on the number of needles per group of needles.

5. Circular knitting machine according to claim 4, characterized by a cutting device (60)

5 with two cutting elements (61) adjustable to the width of the strip (56), for cutting out the strip (56) during the continuous knitting operation.

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